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TRANSMITTAL OF APPEAL BRIEF	Docket No. 03226/158001; P6867

In re Application of: Sudhakar Bobba et al.

Application No.	Filing Date	Examiner	Group Art Unit
10/071,379-Conf. #1774	February 6, 2002	M. Y. Dimyan	2825

Invention: SIGNAL SHIELDING TECHNIQUE USING ACTIVE SHIELDS FOR NON-INTERACTING DRIVER DESIGN

TO THE COMMISSIONER OF PATENTS:

Transmitted herewith is the Appeal Brief in this application, with respect to the Notice of Appeal filed: January 11, 2005 .

32615
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#45,079

Dated: January 11, 2005

Wasif H. Qureshi
Attorney Reg. No. : 51,048
OSHA & MAY L.L.P.
1221 McKinney St., Suite 2800
Houston, Texas 77010
(713) 228-8600

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Dated: January 11, 2005 Signature: Beri Hartwell (Beri W. Hartwell)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Sudhakar Bobba et al. Art Unit : 2825
Serial No.: 10/071,379 Examiner : M. Dimyan
Filed : February 6, 2002
Title : SIGNAL SHIELDING TECHNIQUE USING ACTIVE SHIELDS FOR NON-INTERACTING DRIVER DESIGN

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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PATENT TRADEMARK OFFICE

APPELLANT'S BRIEF UNDER 37 C.F.R. § 1.192

Dear Sir:

Pursuant to the requirements of 37 C.F.R. § 1.192, please consider the following document as the Appellant's Brief in the present application currently before the Board of Patent Appeals and Interferences (hereinafter "the Board").

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TABLE OF AUTHORITIES

Cases

Statutes

Rules

I. Real Party in Interest

The real party in interest in the present application is Sun Microsystems, Inc., assignee of all rights and interests in the present application. Assignment to Sun Microsystems, Inc. from the inventors, Sudhakar Bobba and Tyler Thorp, was recorded in the United States Patent and Trademark Office on February 6, 2002 at Reel 012582, Frame 0400.

II. Related Appeals and Interferences

To the best knowledge of the Appellant and the Appellant's legal representative, there are no other appeals or interferences that will directly affect, be affected by, or have a bearing on the decision of the Board in the pending appeal.

III. Status of Claims

Claims 1-15 were presented in the present application as originally filed. By way of the Response to the Office Action of April 21, 2004, claim 2 was canceled.

Claims 1 and 3-15 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,596,506 issued to Petschauer et al. (hereinafter "Petschauer") in view of U.S. Patent No. 6,285,208 issued to Ohkubo (hereinafter "Ohkubo").

IV. Status of Amendments

All amendments submitted to the Examiner during prosecution of the present application have been entered in the record. No amendments were made subsequent to the entry of the amendments proposed in the Response to the final Office Action of

September 7, 2004. The claims of record in the present application are presented in Section X, Part A, *infra*.

V. Summary of the Invention

The invention described in the present application relates to a technique for shielding signals in a computer system. When two signals in close proximity to each other are at different logic levels, cross-coupling capacitances are likely to develop between the signals as one signal is logic high and the other is logic low.[1] *See* Specification, paragraph [0003]. When such cross-coupling capacitances are present, the switching of one signal to another state may cause noise to be injected on the other signal, thereby potentially leading to undesirable behavior. *See* Specification, paragraph [0003].

In the prior art, in order to prevent or reduce the creation of cross-coupling capacitances between signals, wires are placed next to a signal to "shield" the signal from other signals. *See* Specification, paragraph [0004]. For example, as shown in Figure 2a of the present application, a signal **22** is shielded by (i) a shield wire **24** connected to power **28** and (ii) a shield wire **26** connected to ground **30**. Using such an implementation, signals in close proximity to the signal **22** are not affected by the switching behavior of the signal **22** due to the fact that the signal **22** is shielded by shield wires **24**, **26** that have constant values. *See* Specification, paragraph [0004].

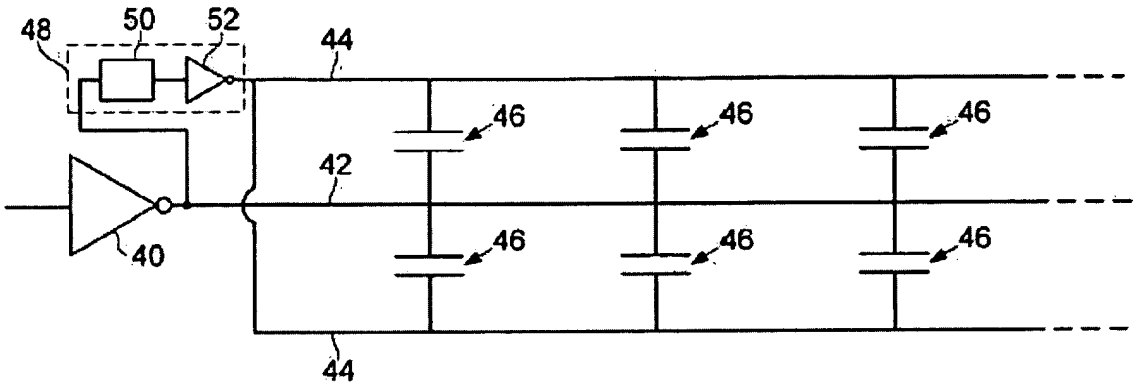
Still referring to Figure 2a of the present application, the voltages of the shield

[1] Those skilled in the art will recognize that a charge-up of capacitance between wires increases as the voltage differential between the signals increases. Such charge is discharged as the voltage differential between the signals decreases.

wires **24, 26** result in capacitances between the signal **22** and the shield wires **24, 26** based on the value of the signal **22**. *See* Specification, paragraph [0004]. For example, when signal **22** is logic low, charge-up of capacitances **32** between the "high" shield wire **24** and signal **22** occurs, and when signal **22** is logic high, charge-up of capacitances **34** between the "low" shield wire **26** and signal **22** occurs. Thus, as shown in Figures 2b and 2c of the present application, whenever a signal driver **20** switches the state of the signal **22**, either capacitances **32** or capacitances **34** are charged, thereby resulting in a charging event. *See* Specification, paragraph [0007]. Charging events require charge sharing among particular capacitors as there is a limited amount of charge available in a particular system. *See* Specification, paragraph [0007]. Thus, during a charging event, there is a potential for drivers that are switching at the same time to interact with each other due to the simultaneous need for charge, possibly resulting in undesirable behavior. *See* Specification, paragraph [0007].

Embodiments of the invention described in the present application relate to a technique for shielding signals in such a manner as to avoid or reduce the interaction among signal drivers. *See* Specification, paragraph [0018]. This is achieved through the use of active shields that dynamically switch state such that a driver of a signal shielded by the shields only participates in discharge events. *See* Specification, paragraph [0019]. For example, with reference to Figure 3a of the present application (reproduced below), (i) after a signal driver **40** drives signal **42** to logic high, shield control circuitry **48** drives shield wires **44** to logic low, thereby resulting in a charge-up of capacitance **46** between the signal **42** and shield wires **44** that is subsequently discharged when the signal driver **40** next drives signal **42** to logic low, and (ii) after a signal driver **40** drives signal **42** to

logic low, shield control circuitry **48** drives shield wires **44** to logic high, thereby resulting in a charge-up of capacitance **46** between the signal **42** and shield wires **44** that is subsequently discharged when the signal driver **40** next drives signal **42** to logic high. In such a manner, the active shielding of signal **42** by shield control circuitry **48** ensures that signal driver **40** only participates in discharge events. *See* Specification, paragraphs [0022] – [0024].



Accordingly, independent claim 1 of the present application requires, in part, shield control circuitry that, after a transition on a signal path, causes a shield wire to transition to a value that causes a charge up of capacitance between the signal path and the shield wire, where a subsequent transition on the signal path causes a discharge of capacitance between the signal path and the shield wire. Further, independent claim 12 of the present application requires, in part, shielding control means for actively controlling a value on wires shielding a signal path such that a driving means for generating a signal on the signal path only participates in discharge events.

Further, as shown by the timing diagram in Figure 3b of the present application, after a transition **60**, **64** on a signal, a shield wire shielding the signal respectively transitions **62**, **66** to cause a charging of capacitance between the signal and the shield

wire so that upon the next transition of the signal, a discharge event occurs. *See* Specification, paragraph [0025] – [0028]. Accordingly, independent claim 13 of the present application requires (i) after a signal on a signal path has transitioned to a first voltage potential, charging a capacitor by causing a wire to transition to a second voltage potential, where the wire shields the signal path, and (ii) discharging the capacitor when the signal path transitions to the second voltage potential.

VI. Issue(s)

The issue presented on appeal is:

1. Whether claims 1 and 3-15 of the present application are unpatentable under 35 U.S.C. § 103(a) as being obvious in view of Petschauer and Ohkubo (*see* final Office Action of September 7, 2004, 2004, pages 2 – 4).

VII. Grouping of Claims

Claims 1 and 3-11 stand or fall together.

Claim 12 stands or falls by itself.

Claims 13-15 stand or fall together.

VIII. Argument

A. Claims 1 and 3-15 are Patentable over Petschauer and Ohkubo under 35 U.S.C. § 103(a)

1. All the Limitations of Independent Claim 1 and Dependent Claims 3-11 are Not Disclosed

To establish a *prima facie* case of obviousness, the prior art reference (or

references when combined) must suggest or teach *all* the limitations of the claimed invention. *See In re Royka*, 490 F.2d 981 (C.C.P.A. 1974); MPEP §§ 706.02(j), 2143.03. If even a single claim limitation is not taught or suggested by the prior art, then that claim cannot be obvious over the prior art. *See In re Glass*, 472 F.2d 1388, 1392 (C.C.P.A. 1973).

As discussed above in Section V, *supra*, independent claim 1 of the present application each, in part, requires shield control circuitry that, after a transition on a signal path, causes a shield wire to transition to a value that causes a charge up of capacitance between the signal path and the shield wire, where a subsequent transition on the signal path causes a discharge of capacitance between the signal path and the shield wire. *See also* Section X, Part A, *infra*. With respect to this claim limitation, the Examiner expressly states that Petschauer "does not teach the use of shield control circuitry." *See* final Office Action of September 7, 2004, page 3. Appellant has reviewed Petschauer and agrees with the Examiner that Petschauer fails to disclose this claim limitation. However, the Examiner states that Petschauer and Ohkubo, in combination, "disclose all the elements of claim 1" because Ohkubo "teaches a semiconductor IC that includes signal lines, a plurality of shield wiring lines, as well as shield control circuitry [], and discloses how effective shielding in IC circuits can be accomplished using his shielding methodology." *See* final Office Action of September 7, 2004, page 3.

However, Ohkubo's purported disclosure of an integrated circuit having signals, shield wires, and circuitry to control the shield wires fails at least to meet the requirements of independent claim 1 of the present application discussed above. Figures

6A – 6I of Ohkubo, which show timing waveforms for the circuitry shown in Figure 5 of Ohkubo, clearly show that the values of shield wires **S1**, **S2** and **S3**, **S4** transition *with* a transition of signal **F2**, **F4**, respectively. Similarly, Figures 7A – 7C, which also show timing waveforms for the circuitry shown in Figure 5 of Ohkubo, clearly show that a value of a shield wire **S4** transitions *with* a transition of signal **F4**. Thus, in Ohkubo, a value of a shield wire is controlled to transition *with* a transition of a signal shielded by the shield wire, not *after* a transition of a signal as required by independent claim 1 of the present application.

Further, Ohkubo discloses controlling a shield wire to transition to a value of a signal shielded by the shield wire. *See, e.g.*, Ohkubo, Abstract; column 4, lines 38 – 44 (disclosing that a signal supplied to shield wires adjacent to a specific signal "is switched to have a *same* phase as an input signal which is supplied to the specific signal") (emphasis added). Thus, because a shield wire is caused to transition to a value equal to that of a signal shielded by the shield wire, there is no charge-up of capacitance between the shield wire and the signal as required by independent claim 1 of the present application. Necessarily, a subsequent transition on a signal in Ohkubo does not result in a discharge of capacitance as otherwise required by independent claim 1 of the present application. Accordingly, Ohkubo's mere purported disclosure of an integrated circuit having signals, shield wires, and circuitry to control the shield wires clearly fails to teach all the limitations of independent claim 1 of the present application or supply that which Petschauer lacks.

Thus, for the foregoing reasons, Petschauer and Ohkubo, whether considered separately or in any combination, fail to disclose or suggest all the limitations of

independent claim 1 of the present application. Further, because a claim depending from an independent claim that is not obvious under 35 U.S.C. § 103(a) is also not obvious, *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988), dependent claims 3-11 of the present application are also patentable for at least the same reasons. Accordingly, reversal of the Examiner's 35 U.S.C. § 103(a) rejections of claims 1 and 3-11 of the present application is respectfully requested.

2. All the Limitations of Independent Claim 12 are Not Disclosed

As discussed above in Section V, *supra*, independent claim 12 of the present application, in part, requires shielding control means for actively controlling a value on wires shielding a signal path such that a driving means for generating a signal on the signal path *only* participates in discharge events. *See also* Section X, Part A, *infra* (emphasis added). With respect to this claim limitation, the Examiner states that Figures 6F – 6H of Ohkubo show "how the wires shielding the signal path are controlled to only participate in discharge events ("0" to "1" transitions)". *See* final Office Action of September 7, 2004, page 4. However, such a characterization is inaccurate because there is no charge to discharge between signal **F4** and shield wires **S3**, **S4** in Figures 6F – 6H of Ohkubo. The values of signal **F4** and shield wires **S3**, **S4** remain the same before, during, and after the transition of signal **F4**, thereby preventing the charge-up of capacitance between signal **F4** and shield wires **S3**, **S4**. There can be no discharge of capacitance if there is initially no capacitive charge created. This is also the case in Figures 6B – 6D of Ohkubo as shield wires **S1**, **S2** shielding transitioning signal **F1** have the same value as signal **F1** before, during, and after the transition of signal **F1**, thereby preventing the charge-up of capacitance between signal **F1** and shield wires **S1**, **S2**.

Ohkubo is completely silent as to a case in which a shield wire is always caused to transition to a value that results in a charge-up of capacitance between the shield wire and a signal shielded by the shield wire so that a means for driving the signal *only* participates in discharge events as required by independent claim 12 of the present application. In fact, as discussed above, Ohkubo clearly emphasizes driving a shield wire to a *same* phase of the signal shielded by the shield wire (*see, e.g.*, Ohkubo, Abstract; column 4, lines 38 – 44 (emphasis added)), as opposed to driving the shield wire to a phase opposite to that of the signal, thereby creating a charge-up of capacitance between the signal and shield wire and ensuring that a signal driver driving the signal only participates in discharge events.

Thus, for the foregoing reasons, Petschauer and Ohkubo, whether considered separately or in combination, fail to disclose or suggest all the limitations of independent claim 12 of the present application. Accordingly, reversal of the Examiner's 35 U.S.C. § 103(a) rejection of claim 12 of the present application is respectfully requested.

3. All the Limitations of Independent Claim 13 and Dependent Claims 14 and 15 are Not Disclosed

As discussed above in Section V, *supra*, independent claim 13 of the present application requires (i) after a signal on a signal path has transitioned to a first voltage potential, charging a capacitor by causing a wire to transition to a second voltage potential, where the wire shields the signal path, and (ii) discharging the capacitor when the signal path transitions to the second voltage potential. *See also* Section X, Part A, *infra*. Further, as discussed above in Section VIII, Part 1, *supra*, Ohkubo fails to disclose charging up a capacitance between a signal and a shield wire after a transition on the signal. Accordingly, as there is no such charging of a capacitor in Ohkubo, Ohkubo

necessarily fails to disclose discharging the capacitor when the signal subsequently transitions as otherwise required by independent claim 13 of the present application.

Thus, for the foregoing reasons, Petschauer and Ohkubo, whether considered separately or in any combination, fail to disclose or suggest all the limitations of independent claim 13 of the present application. Further, because a claim depending from an independent claim that is not obvious under 35 U.S.C. § 103(a) is also not obvious, *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988), dependent claims 14 and 15 of the present application are also patentable for at least the same reasons. Accordingly, reversal of the Examiner's 35 U.S.C. § 103(a) rejections of claims 13-15 of the present application is respectfully requested.

4. No Motivation or Suggestion to Combine

To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. The teaching or suggestion to make the claimed combination must be found in the prior art and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). The mere fact that references *can* be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *See In re Mills*, 916 F.2d 680 (Fed. Cir. 1990) (emphasis added).

In the final Office Action of September 7, 2004, the Examiner asserts that it would have been obvious to a person of ordinary skill the art to combine the teachings of Petschauer and Ohkubo in order to "eliminate or minimize crosstalk and noise problems created by cross-coupling capacitances." *See* final Office Action of September 7, 2004,

page 4. However, it is wholly unclear why one of ordinary skill in the art presented with Petschauer, which is generally directed to a technique for fabricating an integrated circuit such that crosstalk voltages injected on a signal are within an acceptable noise margin (*see* Petschauer, Abstract; column 1, lines 9 – 13), would turn to the teachings of Ohkubo, which is directed to circuitry that causes shield wires to transition to a same phase of a signal shielded by the shield wires (*see* Ohkubo, Abstract; column 4, lines 34 – 44), or vice-versa. More specifically, while Petschauer is concerned with fabricating an integrated circuit based on simulating a chip layout to determine a layout in which an estimated crosstalk voltage in a signal is within an acceptable level (*see* Petschauer, column 2, line 61 – column 3, line 14), Ohkubo is concerned with (i) ensuring that an effective interline capacitance parasitically accompanies signals for connecting the blocks of an integrated circuit (*see* Ohkubo, column 4, lines 20 – 25), (ii) increasing an activation speed of a signal (*see* Ohkubo, column 4, lines 26 – 29), and (iii) driving a signal with a driving circuit with a small area rather than one with a large area (*see* Ohkubo, column 4, lines 30 – 33). Thus, Petschauer and Ohkubo are directed to distinctly different objectives and there is no suggestion of desirability in either Petschauer or Ohkubo for combining its teachings with that of the other. Without such an suggestion, regardless of whether the references can be combined, the references are not properly combinable for 35 U.S.C. § 103 purposes. *See In re Mills*, 916 F.2d 680 (Fed. Cir. 1990).

Thus, for the foregoing reasons, Petschauer and Ohkubo are not properly combinable and thus cannot be used in obviousness rejections of independent claims 1, 12, and 13 of the present application. Further, because a claim depending from an

independent claim that is not obvious under 35 U.S.C. § 103(a) is also not obvious, *In re Fine*, 837 F.2d 1071 (Fed. Cir. 1988), dependent claims 3-11, 14, and 15 of the present application are also patentable for at least the same reasons. Accordingly, reversal of the Examiner's 35 U.S.C. § 103(a) rejections of claims 1 and 3-15 of the present application is respectfully requested.

IX. Conclusion

The Summary of the Invention provided in Part V, *supra*, in combination with the arguments presented in Part VIII, *supra*, clearly show that claims 1 and 3-15 of the present application are patentable over the prior art of record. Therefore, Appellant respectfully requests that the Board reverse the Examiner's rejections of claims 1 and 3-15 under 35 U.S.C. § 103(a).

Please apply any charges not covered, or any credits, to Deposit Account 50-0591 (Reference No. 03226.158001; P6867).

Respectfully submitted,

Date: 1/11/05

#45,079

Wasif Qureshi, Reg. No. 51,048
OSHA & MAY L.L.P.
1221 McKinney Street, Suite 2800
Houston, TX 77010

Telephone: (713) 228-8600
Facsimile: (713) 228-8778

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X. Appendix

A. Claims of Record in the Present Application

1. An integrated circuit, comprising:

a signal driver that generates a signal on a signal path;

a first wire disposed adjacent to the signal path; and

shield control circuitry that, after a transition on the signal path, causes the first wire to transition to a value that causes a charge up of capacitance between the signal path and the first wire, wherein a subsequent transition on the signal path causes a discharge of capacitance between the signal path and the first wire.

2. (Canceled)

3. The integrated circuit of claim 1, further comprising a capacitor having one terminal operatively connected to the signal path and another terminal operatively connected to the first wire.

4. The integrated circuit of claim 1, wherein the signal driver is a transistor.

5. The integrated circuit of claim 1, wherein the signal driver is a gate.

6. The integrated circuit of claim 1, wherein the shield control circuitry is dependent on the signal driver.

7. The integrated circuit of claim 1, further comprising a second wire disposed adjacent to the signal path, wherein the first and second wires are used to shield the signal path.

8. The integrated circuit of claim 7, wherein the shield control circuitry comprises inverting circuitry that outputs onto the first and second wires dependent on a synchronous signal input to the shield control circuitry.

9. The integrated circuit of claim 7, wherein the shield control circuitry comprises inverting circuitry that outputs onto the first and second wires dependent on an asynchronous signal input to the shield control circuitry.

10. The integrated circuit of claim 7, wherein the shield control circuitry comprises:

a delay element; and

inverting circuitry that outputs onto the first and second wires.

11. The integrated circuit of claim 10, wherein the delay element generates a delay greater than a signal propagation delay of the signal.

12. An integrated circuit, comprising:

driving means for generating a signal on a signal path; and

shielding control means for actively controlling a value on wires shielding

that signal path such that the driving means only participates in discharge events.

13. A method for non-interactively driving a signal on a signal path, comprising:

after the signal on the signal path has transitioned to a first voltage potential, charging a capacitor by causing a wire to transition to a second voltage potential, wherein the wire shields the signal path; and

discharging the capacitor when the signal path transitions to the second voltage potential.

14. The method of claim 13, wherein the capacitor has one terminal operatively connected to the wire and another terminal operatively connected to the signal path.

15. The method of claim 13, further comprising selectively delaying the driving of the wire to the second potential.